Non-CO_2 Greenhouse Gases: Methane

Source/Sectors: Natural Gas Systems (Field Production)

Technology: Options to reduce emissions during well testing and completion (A.1.2.1.1)

Description of the Technology:
In the United States and worldwide, many efforts have been made to identify and implement mitigation options to reduce methane emissions from the natural gas sector (USEPA, 2003). For example, the Natural Gas STAR program is a voluntary partnership between US EPA and the oil and gas industry to identify and implement cost-effective technologies and measures to reduce methane emissions. The measures to reduce methane emissions from the natural gas systems can be grouped into the following mitigation strategies: prevention, recovery and re-injection, recovery and utilization, and recovery and incineration (Hendriks & de Jager, 2001).

Technological options to reduce CH_4 emissions from natural gas field operations during well testing and completion include the following:

- Good housekeeping practices to reduce blowouts – Improved equipment, procedures, and training of personnel would reduce the risks of blowout during exploration (de Jager *et al.*, 2001).
- Good operational procedures with regards to well-testing – Operational procedures can be optimized to minimize gas flow and duration of the tests during exploration. In the Netherlands, procedures have been tightened and the duration of a test is limited to 20 to 70 hours (de Jager *et al.*, 2001).
- Flaring of gas produced at well tests (during exploration) – Mobile flare installations can be used for this purpose to reduce methane emissions (de Jager *et al.*, 2001).
- Green completion – The common practice in gas well completion is to flare or vent initial produced gas. An alternative is to bring potable equipment to the well site that cleans up the initial produced gas to pipeline sales standard (Fernandez *et al.*, 2005).

Effectiveness: Good

Implementability: Good

Reliability: Good

Maturity: Good

Environmental Benefits: It reduces methane emissions by minimizing venting and/or converting methane to carbon dioxide which has a much lower GWP.

Cost Effectiveness: Good

Industry Acceptance Level: Good

Limitations: Additional investment on equipment may be needed.

Sources of Information:

1. California Energy Commission (2005) "Emission Reduction Opportunities for Non-CO_2 Greenhouse Gases in California", a report prepared by ICF Consulting for California Energy Commissions, CEC-500-2005-121, July 2005.
2. de la Chesnaye, F.; Harvey, R.; Kruger, D.; Laitner, J.A. (2001) "Cost-effective Reduction of Non-CO_2 Greenhouse Gases", Energy Policy 29, 1325-1331.
3. Delhotal, K.G.; de la Chesnaye, F.C.; Gardinar, A.; Bates, J.; Sankovski, A. (2006) "Mitigation of Methane and Nitrous Oxide Emissions from Waste, Energy and Industry" *The Energy Journal*, Multi-Greenhouse Gas Mitigation and Climate Policy Special Issue, pp. 45-62.
4. European Commission (2001) "Economic Evaluation of Sectoral Emission Reduction Objectives for Climate Change", Brussels. (Document can be found at http://ec.europa.eu/environment/enveco/climate_change/sectoral_objectives.htm)
5. Fernandez, R.; Lieberman, D.; Robinson, D. (2004) "U.S. Natural Gas STAR Program Success Points to Global Opportunities to Cut Methane Emissions Cost-Effectively", *Oil & Gas J.* July 12.
6. Fernandez, R.; Petrusak, R.; Robinson, D.; Zavadil, D. (2005) "Cost-Effective Methane Emissions Reductions for Small and Midsize Natural Gas Producers", *J. Petroleum Technology*, June.
7. Hendriks, C.; de Jager, D. (2001) "Economic Evaluation of Methane Emission Reductions in the Extraction, Transport and Distribution of Fossil Fuels in the EU: Bottom-up Analysis", A final report to European Commission.
8. International Energy Agency (2003) "Building the Cost Curves for the Industrial Sources of Non-CO_2 Greenhouse Gases", Report Number PH4/25, IEA Greenhouse Gas R&D Programme, Cheltenham, United Kingdom, October 2003.
9. Lucas, P.L.; van Vuuren, D.P.; Jos Oliver, G.J.; den Elzen, M.G.J. (2006) "Long-term Reduction Potential of Non-CO_2 Greenhouse Gases", Netherlands Environment Assessment Agency (MNP), published on line November 28, 2006.
10. Tingley, K.A.; Fernandez, R. (2003) "Methods for Reducing Methane Emissions from Natural Gas Systems", *Proc. 3rd International Methane and Nitrous Oxide Mitigation Conf.* November 17-21, Beijing, China.
11. U.S. Climate Technology Program (2005) "Technology Options for the Near and Long Term", U.S. Department of Energy, http://www.climatetechnology.gov/index.htm, August 2005.
12. U.S. Environmental Protection Agency (1999) "Report on U.S. Methane Emissions 1990-2020: Inventories, Projections, and Opportunities for Reductions", United States Environmental Protection Agency, EPA 430-R-99-013, September 1999.
13. U.S. Environmental Protection Agency (2003) "International Analysis of Methane and Nitrous Oxide Abatement Opportunities: Report to Energy Modeling Forum, Working Group 21", a report prepared by ICF Consulting for the United States Environmental Protection Agency.
14. U.S. Environmental Protection Agency (2004) "International Methane and Nitrous Oxide Emissions and Mitigation Data", United States Environmental Protection Agency. Available online at www.epa.gov/methane/appendices.html (in Excel file).
15. U.S. Environmental Protection Agency (2006a) "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 to 2004", Office of Atmospheric Programs, United States Environmental Protection Agency, EPA-430-R-06-002, June 2006.
16. U.S. Environmental Protection Agency (2006b) "Global Mitigation of Non-CO_2 Greenhouse Gases", Office of Atmospheric Programs, United States Environmental Protection Agency, EPA-430-R-06-005, June 2006.